Deficiency of MIWI2 (Piwil4) induces mouse erythroleukemia cell differentiation, but has no effect on hematopoiesis in vivo.

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Public Summary:
Piwi proteins and their small non-coding RNA partners are involved in the maintenance of stem cell character and genome integrity in the male germ cells of mammals. Absence of MIWI2, a mouse Piwi-like protein, leads to meiotic defects and a progressive loss of germ cells. There is also an accumulation of evidence that Piwi proteins may be active in hematopoietic tissues. The purpose of this study was to determine whether MIWI2 also has a role in hematopoietic stem and/or progenitor cell self-renewal and differentiation. MIWI2 mRNA can be detected in a mouse erythroblast cell line by RNA-seq, and knockdown of this mRNA causes the cells to take on characteristics of differentiated erythroid precursors. However, no hematopoietic abnormalities were detected in a MIWI2-deficient mouse model. While subtle, non-statistically significant changes were noted in the hematopoietic function of mice without a functional MIWI2 gene when compared to wild type mice, our results show that MIWI2 is not solely necessary for hematopoiesis within the normal life span of a mouse.

Scientific Abstract:
Piwi proteins and their small non-coding RNA partners are involved in the maintenance of stem cell character and genome integrity in the male germ cells of mammals. MIWI2, one of the mouse Piwi-like proteins, is expressed in the prepachytene phase of spermatogenesis during the period of de novo methylation. Absence of this protein leads to meiotic defects and a progressive loss of germ cells. There is an accumulation of evidence that Piwi proteins may be active in hematopoietic tissues. Thus, MIWI2 may have a role in hematopoietic stem and/or progenitor cell self-renewal and differentiation, and defects in MIWI2 may lead to abnormal hematopoiesis. MIWI2 mRNA can be detected in a mouse erythroblast cell line by RNA-seq, and shRNA-mediated knockdown of this mRNA causes the cells to take on characteristics of differentiated erythroid precursors. However, there are no detectable hematopoietic abnormalities in a MIWI2-deficient mouse model. While subtle, non-statistically significant changes were noted in the hematopoietic function of mice without a functional MIWI2 gene when compared to wild type mice, our results show that MIWI2 is not solely necessary for hematopoiesis within the normal life span of a mouse.